

CLAIMS

What is claimed is:

1. A cooling structure for an integrated circuit structure having multiple integrated circuit chips, said cooling structure comprising:
 - a plurality of heat spreaders, wherein the lower side of each of said heat spreaders is connected to the top of a corresponding one of said integrated circuit chips; and
 - a heat dissipating structure connected to the upper sides of said heat spreaders through a thermally conductive material,
 - wherein said thermally conductive material is positioned in gaps between the upper sides of said heat spreaders and the bottom of said heat dissipating structure, and
 - wherein the smallest of said gaps exists between the top of the heat spreader that is connected to the integrated circuit chip that produces the most thermal energy, relative to the other integrated circuit chips, and the bottom of said heat dissipating structure.
2. The structure in claim 1, wherein said heat spreaders have different thicknesses.
3. The structure in claim 1, wherein said heat spreaders have different coefficients of thermal conductivity.
4. The structure in claim 1, further comprising of a thermal adhesive connecting said heat spreaders to said integrated circuit chips.
5. The structure in claim 1, wherein said thermally conductive material comprises a plurality of thermally conductive materials having different coefficients of thermal conductivity.

6. The structure in claim 1, wherein said thermally conductive material comprises one of a thermal grease and a phase change material.
7. The structure in claim 1, wherein said integrated circuit chips comprise at least one higher power chip and at least one lower power chip, wherein, during operation, said higher power chip generates more thermal energy than said lower power chip.
8. A cooling structure for an integrated circuit structure, said cooling structure comprising:
 - a chip carrier comprising multiple integrated circuit chips;
 - a cap connected to said chip carrier and to the top of the integrated circuit chip that produces the most thermal energy, relative to the other integrated circuit chips;
 - a plurality of heat spreaders, wherein the lower side of each of said heat spreaders is connected to the top of a corresponding integrated circuit chip of said other integrated circuit chips; and
 - a heat dissipating structure connected to the upper sides of said heat spreaders and said cap through a thermally conductive material,wherein said thermally conductive material is positioned in gaps, wherein said gaps exist between the tops of said heat spreaders and the bottom of heat dissipating structure, and between the upper side of said cap and the bottom of said heat dissipating structure, and
 - wherein the smallest of said gaps exists between the upper side of said cap and the bottom of said heat dissipating structure.
9. The structure in claim 8, wherein said cap includes a piston.
10. The structure in claim 8, wherein said heat spreaders have different thicknesses than said cap.
11. The structure in claim 8, wherein said heat spreaders have different coefficients of thermal conductivity than said cap.

12. The structure in claim 8, further comprising a thermal adhesive connecting said heat spreaders to said integrated circuit chips.
13. The structure in claim 8, wherein said thermally conductive material comprises one of a thermal grease and a phase change material.
14. The structure in claim 8, wherein said integrated circuit chips comprise at least one higher power chip and at least one lower power chip, wherein, during operation, said higher power chip generates more thermal energy than said lower power chip.
15. A cooling structure for an integrated circuit structure having multiple integrated circuit chips, said cooling structure comprising:
- a heat spreader connected to the integrated circuit chip that produces the most thermal energy, relative to the other integrated circuit chips; and
 - a heat dissipating structure connected to the upper side of said heat spreader and to the upper sides of said other integrated circuit chips,
- wherein thermally conductive material is positioned in gaps, wherein said gaps exist between the upper side of said heat spreader and the bottom of said heat dissipating structure, and between the upper sides of said integrated circuit chips and the bottom of said heat dissipating structure, and
- wherein the smallest of said gaps exists between the upper side of said heat spreader and the bottom of said heat dissipating structure.
16. The structure in claim 15, wherein said heat dissipating structure including a recess for accommodating said heat spreader.
17. The structure in claim 15, further comprising a thermal adhesive connecting said heat spreader to said integrated circuit chip that produces the most thermal energy.

18. The structure in claim 15, wherein said thermally conductive material comprises a plurality of thermally conductive materials having different coefficients of thermal conductivity.
20. The structure in claim 15, wherein said thermally conductive material comprises one of a thermal grease and a phase change material.
21. The structure in claim 15, wherein said integrated circuit chips comprise at least one higher power chip and at least one lower power chip, wherein, during operation, said higher power chip generates more thermal energy than said lower power chip.
22. A cooling structure for an integrated circuit structure, said cooling structure comprising:
a chip carrier comprising multiple integrated circuit chips;
a heat dissipating structure connected to the upper sides of said integrated circuit chips through a thermally conductive material,
wherein said thermally conductive material is positioned in gaps between the upper sides of said integrated circuit chips and the bottom of said heat dissipating structure, and
wherein said heat dissipating structure is shaped such that the smallest of said gaps exists between the top of the integrated circuit chip that produces the most thermal energy, relative to the other integrated circuit chips, and the bottom of said heat dissipating structure.
23. The structure in claim 22, wherein said heat dissipating structure has a protrusion positioned adjacent said integrated circuit chip that produces the most thermal energy to allow the smallest of said gaps to exist between said top of said integrated circuit chip that produces the most thermal energy and said bottom of said heat dissipating structure.
24. The structure in claim 22, wherein said thermally conductive material comprises a thermally conductive adhesive.

25. The structure in claim 22, wherein said thermally conductive material comprises a plurality of thermally conductive materials having different coefficients of thermal conductivity.

26. The structure in claim 22, wherein said integrated circuit chips comprise at least one higher power chip and at least one lower power chip, wherein, during operation, said higher power chip generates more thermal energy than said lower power chip.